



# Radar & RIM 100

## Radar Interface Module Installation Instructions

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## Table of Contents

Warnings and Cautions .....	i
Section 1: Introduction.....	1
What is radar? .....	1
Antenna.....	1
Side lobe .....	2
Characteristics of Radar Wave.....	2
Targets difficult to display on screen .....	2
Radar Shadow Zones.....	2
False echoes .....	3
A. Ghost echoes.....	3
B. Multiple echoes .....	3
C. False echoes caused by side lobe.....	3
D. Distant false echoes caused by duct phenomenon.....	3
Radar interference.....	4
Installation Considerations .....	4
Location.....	4
Obtaining sufficient dip angle .....	5
Mounting Base.....	5
Section 2: Radar Installation .....	8
Preparations .....	8
Installation Procedure .....	8
Section 3: RIM 100sp Installation .....	10
Cable Connections and Wiring Diagrams.....	12
Lowrance Radar Specifications .....	16
FCC Compliance.....	17

## Warnings and Cautions

### **Caution:**

*Use this radar at your own risk. This radar was designed for use as a navigation aid. It should not be used for purposes that require precise measurements of direction, distance, topography or location. Always compare the navigation information received from your radar with data from other navigation aids and sources. When a conflict arises between the navigation data from your radar and data from other navigation aids, make sure you resolve the conflict before proceeding with navigation. A **CAREFUL NAVIGATOR NEVER RELIES ON ONLY ONE METHOD TO OBTAIN NAVIGATION INFORMATION.***

**Caution:**

*International Regulations for Preventing Collisions at Sea mandate that when radar is on a vessel, the radar must be used at all times, regardless of weather conditions or visibility. Numerous court decisions have not only ruled the radar must be used, but that the radar operator must be knowledgeable in all operational aspects of radar performance or otherwise face a greater risk of liability if an accident occurs.*

**Caution:**

*If you purchased an open array radar antenna, make sure it is installed in an area free of hardware obstructions and free of potential obstructions like sails, lines or other vessel components that could intermittently intrude or be caught up in the array antenna's rotation path.*

**WARNING: High Voltage Hazard**

Dangerously high voltages are present within the radar scanner unit. The unit contains no user-serviceable parts. The cover should be removed only by a qualified radar service technician. Technicians must exercise extreme care when working inside the unit. ALWAYS remove power before removing the cover. Some capacitors may take several minutes to discharge, even after switching off the radar. Before touching the magnetron or any high voltage components, ground them with a clip lead. There are no internal connections or adjustments necessary for installation.

**WARNING: Microwave Radiation Hazard**

The microwave energy radiated by a radar antenna is harmful to humans, especially to the eyes. NEVER look directly into an open waveguide or into the path of radiation from an enclosed antenna. Radar and other radio frequency radiation can upset cardiac pacemakers. If someone with a cardiac pacemaker suspects abnormal operation, immediately turn off the radar equipment and move the person away from the antenna. Turn off the radar whenever it is necessary to work on the antenna unit or other equipment in the beam of the radar.

# Section 1: Introduction

Thank you for purchasing this Lowrance Radar with the RIM 100 radar interface module. Your radar consists of three main components: the radar scanner unit, a display unit (sold separately) and the RIM 100 radar interface module which connects the scanner unit and the display unit.

We know you're anxious to begin the installation, but first, let us tell you how this manual is organized.

The first section describes how your radar works. We'll also discuss issues to consider when selecting an installation location as well as important safety requirements.

The second section will tell you how to install the radar scanner unit.

The third section covers installing the RIM 100 radar interface module.

Radar operation is covered in another manual that corresponds to your display unit.

The radar scanner unit includes the radar antenna, transmitter, receiver and necessary electronics. The mounting hardware kit and inter-connecting cable also are included with the radar scanner.

## What is radar?

The word "radar" is an acronym for "Radio Detecting And Ranging." In simple terms, this is how it works:

A radio transmitter sends out a quick microwave pulse. A receiver listens for that signal's echo when it is bounced back from something in its path. When it returns, it is processed by a computer to determine relative distance, position and bearing of the object that reflected the signal. This information is displayed on the display unit's screen. Other boats or ships, navigational markers, landmasses and the like are referred to as targets.

By knowing how long it takes for a signal to return, the distance to a target can be determined. As the radar antenna scans through a 360 degree rotation, it can show where the target is relative to your position. By repeated scans, you can see which direction another vessel is moving.

## Antenna

How radar will perform is largely determined by its antenna or scanner. Increasing the size of the antenna improves long-range performance and target discrimination — the ability to distinguish two sepa-

rate targets at a distance. The critical factors are the antenna's beam width and side lobe level. Typically, a radar antenna will radiate a tightly focused beam from the front of the array. The longer the antenna array is, the narrower the beam width. Additionally, it will also emit smaller amounts of energy to each side. A lower side lobe level lessens the effect of a false echo.

### **Side lobe**

The beam radiating the strongest radio signal from the antenna is called the "main lobe". Those beams radiated in other directions are referred to as "side lobes". The side lobe level indicates the difference in level (signal strength) between the largest side lobe and the main lobe.

## **Characteristics of Radar Wave**

Radio waves travel out from the antenna, bending slightly along the earth's surface. The amount they bend depends on atmospheric conditions. The sight distance of a radar generally is about 6% longer than the optical sight distance and is calculated using this equation:

Where  $h$  is the height of the scanner, the distance to the radar horizon in nautical miles (Nm)

$$= 1.22\sqrt{h(\text{feet})} \quad \text{or} \quad 2.21\sqrt{h(\text{meters})}$$

### **Targets difficult to display on screen**

The intensity of the reflected radio signal from a target depends on the distance, height, size of the target, the target's material and shape along with the radar's transmitter power output and antenna size.

Targets made of fiberglass, wood, or other low-reflectance materials or those that have a small incident angle are difficult to display on a screen. Sandy beaches and sandy or muddy shallows can be difficult to pick up. A coastline can actually be closer to your boat than it appears on the screen, because there's not much to reflect a signal back to you.

### **Radar Shadow Zones**

Radar waves propagate in a straight line. A high outcropping of land or a large ship will create a shadow zone behind it and prevent you from seeing targets on the other side. Radar is a line-of-sight view of targets and obstructions.

More importantly, if a mast or some part of the boat's superstructure is in the path of the antenna's sweep, this will also create a shadow zone. No targets will be recognized behind it and it could create a dangerous situation.

## **False echoes**

Sometimes radar will display targets on screen that do not exist in the real world. You should be aware of how and why this happens.

### **A. Ghost echoes**

Sometimes one large object very near your boat will appear as two different targets onscreen. One is the actual radar echo. The other is a ghost echo generated by a re-reflection of the original signal. It comes back to your own boat, bounces back to the target, and then is picked up by the antenna on the second bounce.

The actual echo appears at the correct distance and bearing on the screen. The ghost echo appears somewhere behind your boat. This type of false echo is also generated by re-reflection of radar waves from bridges, quay walls or buildings along the shore.

### **B. Multiple echoes**

If there is a large vertical reflecting surface near your boat, as in the case when you pass alongside a large ship, radar signals are repeatedly bounced back and forth between your boat and the other object. Two to four images may appear on the screen at equal intervals in the same bearing.

This is called a multiple echo. The image appearing closest to you is the real echo. Multiple echoes will disappear as you move away from the reflecting object or its bearing changes.

### **C. False echoes caused by side lobe**

An antenna's side lobe emissions are low power, and will not register distant targets. However, if there is a strong reflecting target near your boat, it sometimes may appear as a circular-arc false echo on the screen.

### **D. Distant false echoes caused by duct phenomenon**

The duct phenomenon sometimes occurs when meteorological conditions create a temperature inversion between layers of air. When this happens, radar waves propagate erratically and can reach a location considerably farther away from your boat than the radar's maximum distance range.

What appears onscreen is a false echo that looks to be nearer than the actual target. Since the true echo from the distant target is outside the measurement capabilities of the radar, its apparent distance will change when you change ranges, and you can conclude that it's a false echo.

## **Radar interference**

If another boat's radar is operating on the same frequency as yours, it can create interference on your display.

The interference usually appears as spiral or radial patterns. This radar has an interference rejection control to eliminate interference. Turn it on to reduce or eliminate the interference.

## **Installation Considerations**

Prior to actual installation of the radar scanner unit, several factors must be considered to assure maximum performance.

### **Location**

The scanner must be located so that passengers and crew are not exposed to the direct radar beam.

### **WARNING:**

**To comply with FCC RF exposure requirements, the radar antenna for this scanner must be installed a minimum distance of 1 foot (0.3 m) or more ABOVE all persons.**



**This is a bad installation! The radar beam will be obstructed by the helm. This can create blind spots or shadow zones on the radar display. More importantly, it will expose persons at the helm to harmful levels of microwave radiation.**



The scanner unit should be mounted on the center line of your vessel in a location that has an unobstructed view forward and is as clear as possible the rest of the way around the unit.

A location as high as practical to improve maximum range is desirable, keeping in mind that minimum range objects may be overlooked if mounted too high.

Position the unit forward of large structures and exhaust stacks. Large structures or stacks cause blind spots. Contamination from engine exhaust on the scanner housing also reduces radar performance.

Antennas for GPS, radio communication or other equipment should not be in the radar beam. Use non-metallic extension poles to move the active area of antennas above the radar beam.

In selecting a location, consider the suitability of the mounting surface. It must be flat and approximately level with the vessel's water line. The surface must support the weight of the scanner and have access to the underside for installation of the four mounting bolts. (Weights are listed in the specifications table in the back of this manual.)

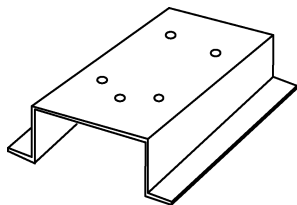
### **Obtaining sufficient dip angle**

Raise the scanner position so that there is a sufficient dip angle available between the line of sight from the scanner to the obstacle and the horizontal line. By raising the dip angle above  $5^{\circ}$ , it is possible to prevent mid- and long-distance shadow zones. The radar cannot detect objects below the line of sight.

### **Mounting Base**

Use a mounting base such as the one shown below, or you can install the scanner directly to a roof or other flat surface. Make sure you keep the water drain tube clear. It's located at the bottom of the scanner unit.

**Note:** If the mounting bracket or surface has a curvature of more than 2 mm, use spacers with the mounting bolts to prevent stress on the scanner housing.



**Mounting base for radar scanner unit.**

The recommended mounting surface thickness is 3/8" to 1/2" (9 mm to 13 mm). If the mounting surface is thin, a doubler should be added. If it is thicker, longer bolts must be purchased.

**WARNING:**

**The scanner will be damaged if bolts penetrate more than 9/16" (15 mm).**

Also, consider the cable route from the scanner to the operator's location. Avoid routing the interconnecting cable through areas of possible damage from moving objects, machinery, exposure to chemicals or high temperature.



**The radar should be installed at least 1 foot above all persons to pre-**

**vent microwave radiation exposure. This antenna is installed correctly. It safely exceeds the recommended separation distance.**

# Section 2: Radar Installation

## Preparations

Unpack your new radar and check the contents against the packing list. Do not remove the cover from the unit. There are no connections or adjustments inside the unit that are needed for installation or operation.

The cable must remain attached. For ease of handling, coil the cable and place it on top of the scanner, then secure it with tape.

Invert the scanner and make sure the four mounting holes are clear to accept bolts. Working at higher elevations may become necessary while installing the scanner unit. Observe safety measures and take sufficient precaution to avoid personal injury or damage to the equipment.

### WARNING:

**To comply with FCC radio frequency (RF) exposure requirements, the radar antenna for this scanner must be installed a minimum distance of 1 foot (0.3 m) or more ABOVE all persons.**

## Installation Procedure

Prepare the mounting surface by making sure it is clean and flat.

### NOTE:

It is a good idea to check the accuracy of the enclosed paper template by measuring the actual dimension between the hole locations. The printing process and moisture absorption can affect accuracy of the print.

1. Use the template provided and mark the location of the four mounting holes. Align the template squarely with the center line of the vessel, with the arrow pointing toward the bow.
2. Drill four 1/2" (13 mm) diameter holes through the mounting surface.
3. Check that each bolt (with lock washer and flat washer) protrude through the mounting surface at least 5/16" (8 mm) but less than 9/16" (15 mm). **If installing a radome model, the bottom of the unit could be damaged if bolts protrude more than 9/16" (15 mm).**
4. Apply marine sealant around each mounting hole.
5. Place the radar scanner unit on the mounting surface. Orient the scanner with the index mark on the housing facing forward (cable gland should be facing aft).

6. Install and tighten four M10 x 25U (M10 x 1") mounting bolts. Use anti-corrosive grease on each bolt to avoid difficulty in removing the bolts later on.

7. Uncoil the scanner cable.

8. Secure the cable near the scanner to support the weight of the cable and prevent strain on the watertight cable seal. If the cable is to pass through tubing or a bulkhead, protect the unfinished end. Do not use the unfinished wires or fabric braid to pull the cable. Attach a fish cord only to the cable jacket.

Route the cable to the RIM 100 module's location, securing it at appropriate points along the way. Make a drip loop and apply sealant at the entry point of an exterior bulkhead.

## Section 3: RIM 100sp Installation

You can install the RIM 100 module in some other order if you prefer, but we recommend this installation sequence:

1. Select a flat surface near the display unit to mount the module. The location must be close enough for the RIM's RS232 data cable to reach the display unit's RS-232 data cable. Use the RIM 100 as a template to mark the location of the pilot holes for the four mounting screws.



**RIM 100sp Radar Interface Module**

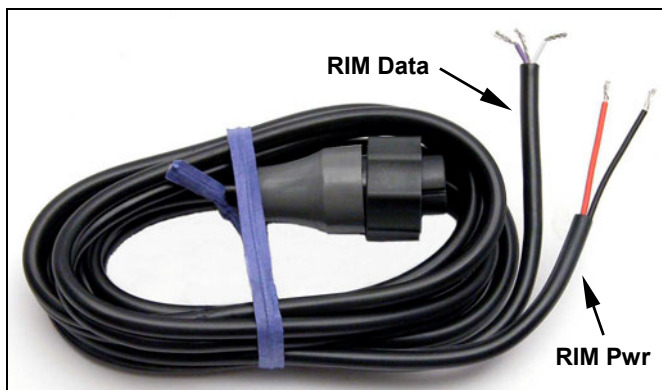
2. Drill four 1/8" (3 mm) diameter pilot holes in the mounting surface.  
3. Use four 3/4" No. 10 stainless steel screws to mount the RIM 100 module.



**RIM 100 module mounted on a bulkhead.**

4. Route the radar cable to the RIM 100 location. Connect the RIM 100 radar data cable to the radar antenna power/data output cable using heat-shrink butt connectors. Follow instructions on the wiring diagram that corresponds to your radar antenna — Detail Drawing A for radome models or Detail Drawing C for open array models. Diagrams are shown on pages 11 through 14.

5. Connect the RIM 100 RS-232 data cable to the display unit RS-232 cable using heat-shrink butt connectors. Follow the instructions on the wiring diagram that corresponds to your radar antenna — Detail Drawing B for radome models or Detail Drawing D for open array models.



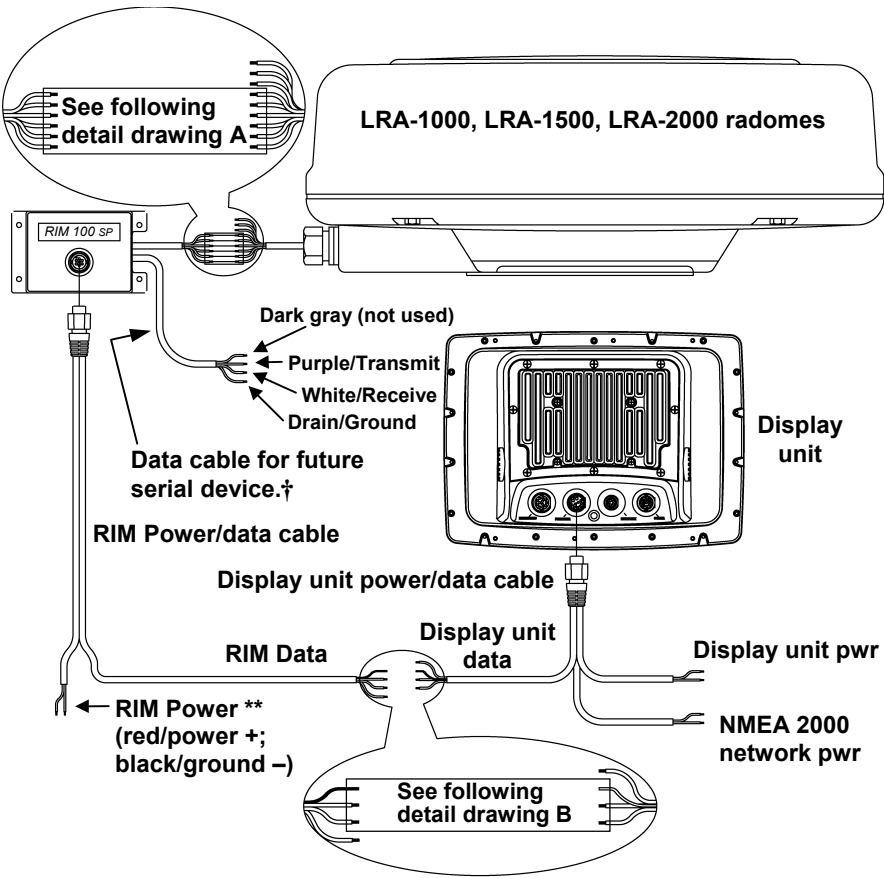
**RIM 100 RS-232 Power/Data Cable**

6. The RIM 100's serial device data cable is unused at this time. To protect the wire ends for future use — and prevent accidental shorts — unused wires should be wrapped in electrical tape or capped with wire nuts.

7. Connect the RIM 100 power cable to the same 12-volt power source as the radar's display unit. The red wire is + and the black wire is –.

8. After wires have been connected and unused wires insulated, insert the module's power/data cable plug in the receptacle on the RIM 100.

# Cable Connections and Wiring Diagrams

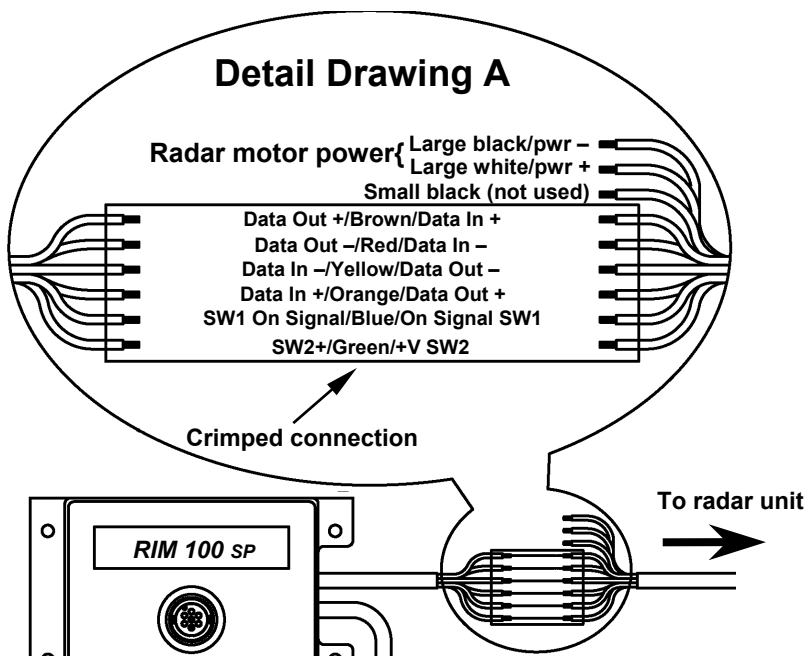


Cable connections and wiring diagrams for Lowrance radar, RIM 100 interface module and display unit. These connections cover radome models LRA-1000, LRA-1500 and LRA-2000.

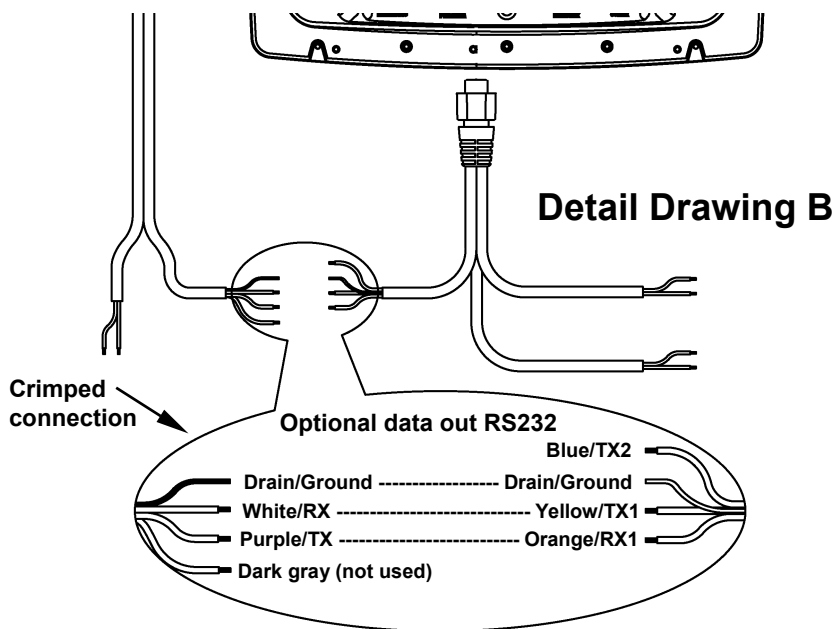
† Serial device data cable may need RIM software update to use.

**\*\*Note:** RIM power cable must be connected to the same 12-volt power source as the radar's display unit.

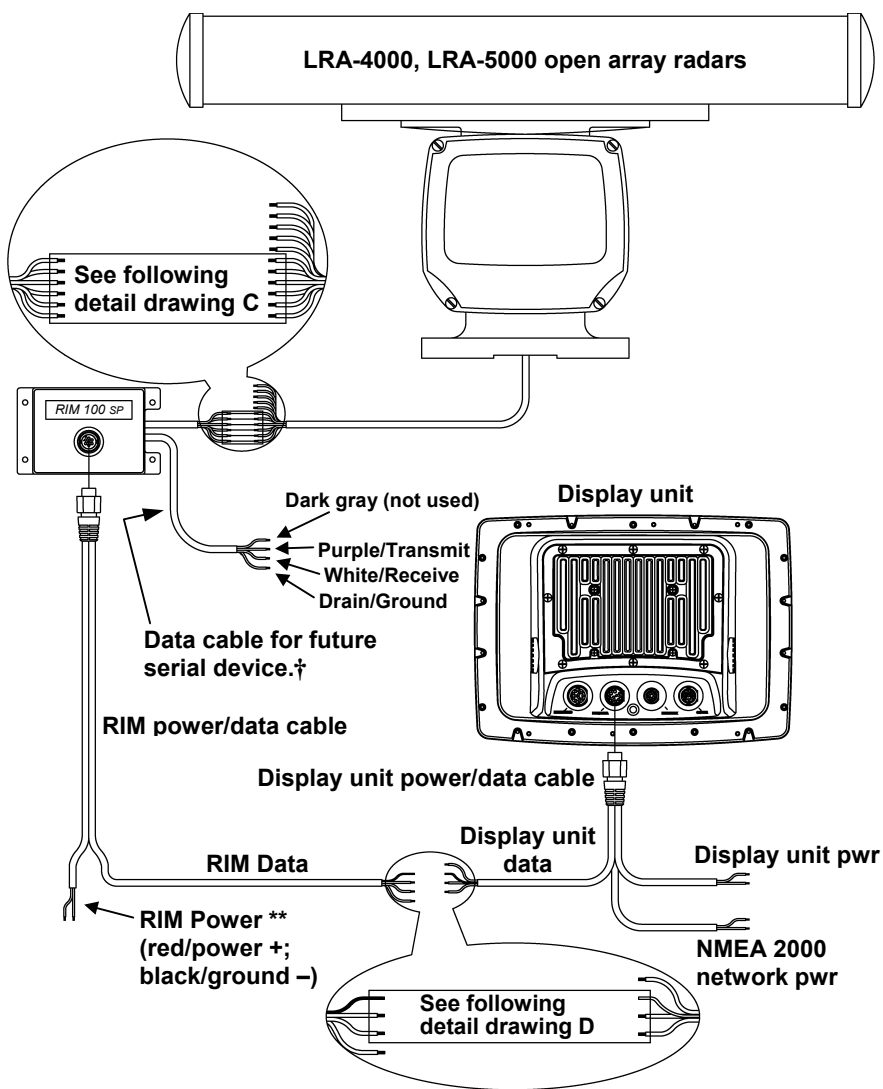




Detail drawing A: wiring diagram, RIM 100 to radome unit.



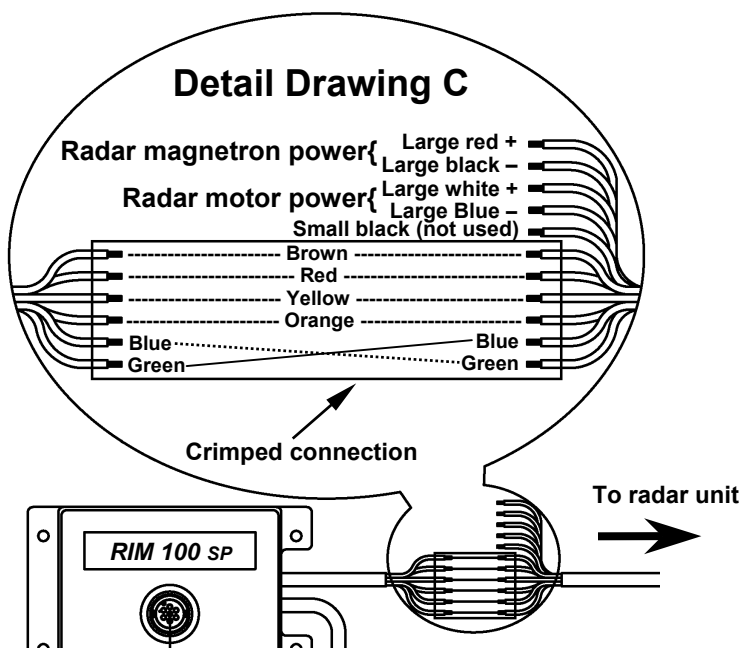
Detail drawing B: wiring diagram, radomes, RIM 100 to display unit.



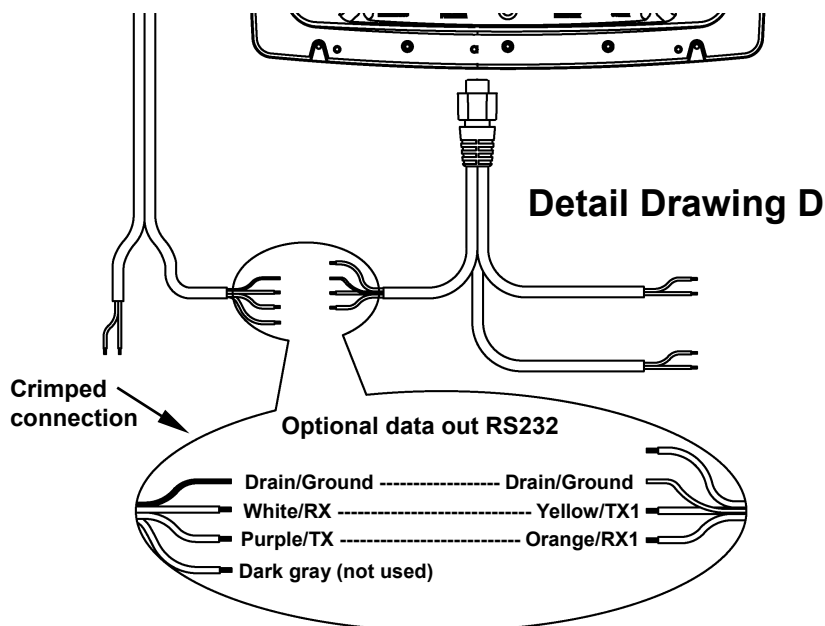
**Cable connections and wiring diagrams for Lowrance radar, RIM 100 interface module and display unit. These connections cover models LRA-4000, LRA-5000 open array radars.**

† Serial device data cable may need RIM software update to use.

**\*\*Note:** RIM power cable must be connected to the same 12-volt power source as the radar's display unit.



Detail drawing C: Wiring diagram, RIM 100 to open array unit.



Detail drawing D: wiring diagram, open arrays, RIM 100 to display unit.

# Lowrance Radar Specifications

Model	LRA-1000	LRA-1500	LRA-2000	LRA-4000	LRA-5000
Radome Diameter	1.0 ft.	1.5 ft.	2.0 ft.	N/A	N/A
Open Array Length	N/A	N/A	N/A	4.0 ft.	5.0 ft.
Power Output	2 kW	2 kW	4 kW	4 kW	4 kW
Power Required	30 watts	55 watts	70 watts	85 watts	95 watts
Voltage Required	10.8-41.6 volts DC	10.8-41.6 volts DC	10.8-41.6 volts DC	10.8-41.6 volts DC	10.8-41.6 volts DC
Slotted Wave Guide Antenna	yes	yes	yes	open array	open array
X-Band (10 GHz)	yes	yes	yes	yes	yes
Rev. Per Min. (RPM)	30	30	24	24	24
Operational Wind Velocity	100 knots	100 knots	100 knots	70 knots	70 knots
Operating Temperature	-13° to 131°F (-25° to +55° C)	-13° to 131°F (-25° to +55° C)	-13° to 131°F (-25° to +55° C)	-13° to 131°F (-25° to +55° C)	-13° to 131°F (-25° to +55° C)
Water Resistance	IPX6 (IEC529)	IPX6 (IEC529)	IPX6 (IEC529)	IPX6 (IEC529)	IPX6 (IEC529)
Cable Length	33 ft. (10 m)	33 ft. (10 m)	33 ft. (10 m)	33 ft. (10 m)	33 ft. (10 m)
Range	24 nm	24 nm	36 nm	48 nm	48 nm
Warm-up Time (Worst Case)	90 sec.	90 sec.	90 sec.	120 sec.	120 sec.
Beam Width Horizontal	7°	4.7°	4°	2.4°	1.7°
Beam Width Vertical	25°	25°	25°	25°	25°
Safety Zone	no	no	yes	yes	yes
Weight	14 lb. (6.4 kg)	15 lb. (6.8 kg)	17.5 lb. (7.8 kg)	48.3 lb. (21.9 kg)	48.3 lb. (21.9 kg)

## FCC Compliance

This device complies with Part 15 of the U.S. Federal Communications Commission (FCC) Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

**Note:**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the factory customer service department for help.

# Notes

# Notes

# Notes



## **LOWRANCE ELECTRONICS FULL ONE-YEAR WARRANTY**

"We," "our," or "us" refers to LOWRANCE ELECTRONICS, INC., the manufacturer of this product. "You" or "your" refers to the first person who purchases this product as a consumer item for personal, family or household use.

We warrant this product against defects or malfunctions in materials and workmanship, and against failure to conform to this product's written specifications, all for one (1) year from the date of original purchase by you. WE MAKE NO OTHER EXPRESS WARRANTY OR REPRESENTATION OF ANY KIND WHATSOEVER CONCERNING THIS PRODUCT. Your remedies under this warranty will be available so long as you can show in a reasonable manner that any defect or malfunction in materials or workmanship, or any non-conformity with the product's written specifications, occurred within one year from the date of your original purchase, which must be substantiated by a dated sales receipt or sales slip. Any such defect, malfunction, or non-conformity which occurs within one year from your original purchase date will either be repaired without charge or be replaced with a new product identical or reasonably equivalent to this product, at our option, within a reasonable time after our receipt of the product. If such defect, malfunction, or non-conformity remains after a reasonable number of attempts to repair by us, you may elect to obtain without charge a replacement of the product or a refund for the product. THIS REPAIR, OR REPLACEMENT OR REFUND (AS JUST DESCRIBED) IS THE EXCLUSIVE REMEDY AVAILABLE TO YOU AGAINST US FOR ANY DEFECT, MALFUNCTION, OR NON-CONFORMITY CONCERNING THE PRODUCT OR FOR ANY LOSS OR DAMAGE RESULTING FROM ANY OTHER CAUSE WHATSOEVER. WE WILL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO ANYONE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, OR OTHER INDIRECT DAMAGE OF ANY KIND.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty does NOT apply in the following circumstances: (1) when the product has been serviced or repaired by anyone other than us; (2) when the product has been connected, installed, combined, altered, adjusted, or handled in a manner other than according to the instructions furnished with the product; (3) when any serial number has been effaced, altered, or removed; or (4) when any defect, problem, loss, or damage has resulted from any accident, misuse, negligence, or carelessness, or from any failure to provide reasonable and necessary maintenance in accordance with the instructions of the owner's manual for the product.

We reserve the right to make changes or improvements in our products from time to time without incurring the obligation to install such improvements or changes on equipment or items previously manufactured.

This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

REMINDER: You must retain the sales slip or sales receipt proving the date of your original purchase in case warranty service is ever required.

**LOWRANCE ELECTRONICS  
12000 E. SKELLY DRIVE, TULSA, OK 74128  
(800) 324-1356**

## **How to Obtain Service...**

### **...in the USA:**

We back your investment in quality products with quick, expert service and genuine Lowrance parts. If you're in the United States and you have technical, return or repair questions, please contact the Factory Customer Service Department. Before any product can be returned, you must call customer service to determine if a return is necessary. Many times, customer service can resolve your problem over the phone without sending your product to the factory. To call us, use the following toll-free number:

**800-324-1356**

8 a.m. to 5 p.m. Central Standard Time, M-F

*Lowrance Electronics may find it necessary to change or end our shipping policies, regulations, and special offers at any time. We reserve the right to do so without notice.*

### **...in Canada:**

If you're in Canada and you have technical, return or repair questions, please contact the Factory Customer Service Department. Before any product can be returned, you must call customer service to determine if a return is necessary. Many times, customer service can resolve your problem over the phone without sending your product to the factory. To call us, use the following toll-free number:

**800-661-3983**

**905-629-1614 (not toll-free)**

8 a.m. to 5 p.m. Eastern Standard Time, M-F

### **...outside Canada and the USA:**

If you have technical, return or repair questions, contact the dealer in the country where you purchased your unit. To locate a dealer near you, visit our web site, [www.lowrance.com](http://www.lowrance.com) and look for the Dealer Locator.

# Accessory Ordering Information for all countries

To order Lowrance accessories for your radar, please contact:

**1)** Your local marine dealer or consumer electronics store. Most quality dealers that handle marine electronic equipment or other consumer electronics should be able to assist you with these items.

To locate a Lowrance dealer near you, visit our web site, [www.lowrance.com](http://www.lowrance.com) and look for the Dealer Locator. Or, you can consult your telephone directory for listings.

**2)** U.S. customers: LEI Extras Inc., PO Box 129, Catoosa, OK 74015-0129  
Call 1-800-324-0045 or visit our web site [www.lei-extras.com](http://www.lei-extras.com).

**3)** Canadian customers can write:  
Lowrance/Eagle Canada, 919 Matheson Blvd. E. Mississauga, Ontario  
L4W2R7 or fax 905-629-3118.

## Shipping Information

If it becomes necessary to send a product for repair or replacement, you must first receive a return authorization number from Customer Service. Products shipped without a return authorization will not be accepted. When shipping, we recommend you do the following:

- 1.** Please do not ship the knobs or mounting bracket with your unit.
- 2.** If you are sending a check for repair, please place your check in an envelope and tape it to the unit.
- 3.** For proper testing, include a brief note with the product describing the problem. Be sure to include your name, return shipping address and a daytime telephone number. An e-mail address is optional but useful.
- 4.** Pack the unit in a suitable size box with packing material to prevent any damage during shipping.
- 5.** Write the Return Authorization (RA) number on the outside of the box underneath your return address.
- 6.** For your security, you may want to insure the package through your shipping courier. Lowrance does not assume responsibility for goods lost or damaged in transit.

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*We Lead, We Find, You Win.<sup>™</sup>*

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